quantities, suitable areas of land on the banks of the river to grow forest produce, etc., must be made available from time to time in place of old unreproductive areas which ought to be disforested.

6.—Injuries to which the crops are liable.

43. The injurious effects of river changes and of frost have been explained. Fires are prevalent where grass abounds and cause immense destruction of the crops, young and old. *Kanh* (*saccharum spontaneum*) is the grass of riverside forests and *sar* (*saccharum arundinaceum*) of dry forests, and each growing dense attains a height of from 10 to 12 ft. and more. Maldars are the principal offenders in causing fires in forest and their object is to stimulate the growth of fresh grass after the stubble has become too coarse for the cattle to eat. Fires in railway-side forests are attributed to sparks from passing locomotives, but here, too, fully 90 per cent. of the occurrences have their origin in incendiarism. Malice and mischief following on cattle-seizure and impounding are often actuating cause of fires.

44. Reproduction is much impeded by illicit grazing and browsing. Regeneration-closures very often exist only on paper; on the ground a closure may be defined to be an area strongly fenced in all round with two or three gaps open on each side for cattle to pass in and out. The gaps are closed for the benefit of the supervising officers' inspection and opened as soon as it is over. Areas closed for reproduction become cattle-runs for "gormal,' that is, cattle which live and breed in forest and have, to a certain extent, lost instinct of domestication but are not ownerless. Forests closed to browsers are closed only to the extent that fees are not credited to Government, the condition of the young growth, argues nevertheless that browsers have been admitted. Many of the *kandi* forests in the division owe their ill-condition to the ravages committed by camels and goats, particularly by the latter. Serious damage to forest growth is also caused by herdsmen in charge of horned-cattle and goats who lop off branches of big trees—babul for choice and cut down saplings so that the animals may feed on the leaves and tender shoots.

45. As minor causes of injury may be mentioned, gall flies which lay their eggs in the terminal branches of *kandi* causing the parts to swell out, the branches eventually withering and falling off. Rats are very destructive to young babul and *kandi* which they gnaw just below the surface of the ground. Their ravages are most marked in seasons of low inundation when they become very numerous.

CHAPTER III.

SYSTEM OF MANAGEMENT.

1.—Past and present systems of management.

46. Nothing is known of the system of management that was applied to the forests after they came into the hands of the British with the conquest of the Province until 1860-61, from which year Forest Administration Reports are available. All the forests then were old shikargas of the Mirs which had been conserved principally in the interest of game and from which all rights and privileges of the people had been rigidly excluded. From 1860-61 to 1871-72, the management was mainly concerned with the supply of wood fuel to the Indus Flotilla Company which carried on business between Sind and the Panjab. The felling and conversion of the wood and its carriage to the banks of the river were done by contract agency, and the company was charged at the rate of Rs. 18-8-0 (reduced to Rs. 16 in 1869-70) per 100 maunds. Firewood was sold at the depôt in Sukkur and was also permitted to be removed from forests for local consumption on payment of permit fees. Timber was extracted by approved purchasers on payment of fees, and beams and rafters of babul and *bahan* were brought to the depôt at Sukkur and auctioned from time to time.

47. The earliest scheme for working the forests on a systematic basis was that proposed by Mr. J. Mc. L. Campbell and which came into force on the 1st April 1875. It divided the forests of a range into 3 or 6 blocks, assumed 15 years for the period of the revolution, and provided for the exploitation of one-third of the entire area in 5 years under clean-felling with standards, the latter to have three or more revolutions to grow into big timber. One-third of the area was to remain open to grazing, and the remaining one-third to be closed for reproduction. This systematic scheme was necessitated by the large demand for firewood for locomotive purposes that was made by the railway which about this time took the place of the Indus Flotilla Company. Additional areas of land were taken up for railway fuel reserves along the track of the railway and were declared reserved forest under the Act in 1879.

48. This working scheme continued in force with slight modification until 1891-92. The modification introduced by Colonel MacRae in 1877-78 provided for a larger area being kept open for grazing owing to the want of fodder being severely felt. To do this, it was decided to close only the area which came under working yearly instead of one-third of the entire area of a forest at once.

49. In 1891-92 Mr. Hexton, Conservator of Forests, introduced the system of clean-felling with standards under a revolution of 12 years, the standards to grow through three revolutions and the exploited areas to remain closed to cattle of all kinds until the young crops were beyond the risk of danger. It must be acknowledged, however, that both this and the preceding schemes existed only on paper; they were never acted up to in practice judging by the condition of the forests and the absence of reliable details on the records. System was ignored and the most shifty methods were resorted to to serve the convenience of exploitation, without regard to the capabilities of the forests. Range executives were practically contractors under the departmental system of working the forests introduced in 1892. The extraction of the material was to be done within sanctioned rates, and large advances varying from Rs. 2,000 to Rs. 7,000 were made at a time to subordinates whose pay varied from Rs. 20 to Rs. 80. It came to be recognised that the smartest officer and the one most deserving of promotion was the one who could supply a large quantity of fuel to the railway and other public bodies; it did not matter whether his compartments were evenly felled over or whether he was getting the work done under sanctioned rates or not. (*Vide* paragraphs 80 to 84 of the Sind Forest Administration Report for 1894-95.)

50. This disorganised state of affairs came to be remedied after Mr. Dasai took charge of the circle in October 1894. The system of making advances to subordinates was finally put a stop to and the extraction and delivery of the fuel were effected through the agency of contractors. In 1895-96 proposals were put forward by Mr. Dasai with a view to the preparation of regular working plans according to the provisions of the Forest department code. The proposals were approved and accepted by Government in the resolution No. 3673, dated the 11th May 1896. The provisional plan which Mr. Dasai proposed to adopt, pending the completion of regular working plans, were to clean-cut babul, *kandi* and *lai* in a regular succession of coupes, giving babul a revolution of 30 years and *kandi* and *lai* a revolution of 10 years. *Bahan* was to be worked by the method of selection fellings. The areas exploited were all marked off on the ground and closed for reproduction, but the regular succession of coupes was disturbed by some of the older coupes which were not clean felled having been put up to auction again and re-worked as coupes of succeeding years.

51. The subject of the supply of wood fuel by the Sind Forest department to the North-Western Railway was discussed in paragraph 37 of the Naushahro Working Plans report. It is now before Government to terminate the agreement regulating the supply; but before doing so the question is being considered whether the Forest department can remuneratively dispose of its fuel in the open market in the event of the Railway demand being withdrawn.

2.—*Special works of improvement undertaken.*

52. Regular plantations were begun about 25 years ago, and are being continued to grow *tali* (*Dalbergia latifolia*) in several riverside forests; about 150 acres are now under *tali*. Many of the plantations have succeeded, and well-grown trees stand in Sadhuja, Bahab, Abad and Kadrapur forests, while recent attempts are very promising in Roati, Abad and other forests. A few cases have been marked by failure on account of the poorness of the soil and insufficiency of water; but on the whole results are very encouraging and further attempts might be made to extend tali-growing areas on the banks of the river as the tree yields valuable timber which commands a ready sale in the market.

53. The Rahuja nursery was established in 1877 with the sanction of the Conservator. This is a plot of land 10 acres 28 guntas in area close to Bindi Dhareja forest and about 3 miles from Sukkur. It was originally intended to serve the purpose of a nursery in which to raise *tali* seedlings for transplantation in the forest, but it eventually developed into a flower, fruit and vegetable garden with several exotics established which were raised and grown experimentally. Bamboos, a couple of teak, several *anjan* (*Hardwickia*) *albizzia*, *acacia catechu*, *cassia fistula*, eucalyptus, *dalbergia* have place in the nursery. The expenditure incurred on it annually is, however, quite out of proportion with the revenue realised as may be seen from the following figures for the last 10 years :—

Note.—The garden is useful as an experimental nursery and the loss incurred on its maintenance is insignificant on that account.

Year		Receipts. Rs.	Charges. Rs.
1892-1893	...	81	675
1893-1894	...	193	524
1894-1895	...	109	589
1895-1896	...	51	655
1896-1897	...	69	705
1897-1898	...	74	703
1898-1899	...	152	702
1899-1900	...	143	655
1900-1901	...	149	590
1901-1902	...	210	610

The receipts obtained were by sale of flowers, fruits and vegetables grown. Seeing that the purpose for which the nursery was originally sanctioned no longer exists, as *tali* is both raised and planted in the forests themselves, it is scarcely necessary to say that, unless it can be made self-supporting, it ought to be quickly abandoned in the interest of economy.

54. The following statement shows the areas of forest land put under cultivation of field crops and the amounts realised by assessment since 1892-93 :—

Year.	Kharif. Acres.	Amount realised. Rs.	Rabi. Acres.	Amount realised. Rs.
1892-1893 ...	479	1,091	2,523	10,408
1893-1894 ...	513	1,596	1,953	8,004
1894-1895 ...	393	980	2,478	9,074
1895-1896 ...	641	1,235	945	3,688
1896-1897 ...	1,358	3,945	462	2,316
1897-1898 ...	1,890	5,040	434	1,736
1898-1899 ...	1,551	3,474	303	1,254
1899-1900 ...	92	249	822	2,816
1900-1901 ...	183	526	618	2,013
1901-1902 ...	60	112	1,666	4,039

Kabi cultivation is permitted on *kachas* only to make use of the land and to realise revenue from it while it is unfit for forest. Kharif crops are grown with the object of sowing up blanks with seedlings raised with the cereals cultivated, but up to the present little, if any, success has been achieved by reason of the fruitless efforts made to establish babul, where it was sylviculturally impossible to do so. From 1895 to 1898 a sum of Rs. 3,102 was expended on a scheme of growing and irrigating babul in Kot Sultan forest: over 2,000 acres of land were put under cereal crops and babul seed was sowed along with the grain. For irrigation 6 sluices were opened in the Sher wah which runs along the south-east boundary of the forest. Everything promised well for a time; the seedlings raised grew, in some instances, to a height of 10 to 12 feet and more; but after 1897, the river running low for three years in succession, the wah failed to respond to the needs of the young babul with the result that frost killed off the plants by thousands in each winter and the land that was cultivated is no further advanced in forest-growth than it was before cultivation was done. Experiments of this sort have been tried often enough now to convince the most sanguine theorist of the utter futility of attempting to grow babul under any artificial system which is not sylviculturally suited to it; and that it is best left to develop itself naturally on the banks of the river where it can and will succeed. The only artificial aid necessary on the *kachas* is protection against browsers and fire. On the other hand blanks can be restocked with *kandi* with the aid of cereal crops. In 1899, Mr. Betham, then Conservator, put a stop to kharif crops to a very large extent because he was of opinion that they did no good (*vide* paragraph 96, Forest Administration Report for 1899-1900). Without advocating the plan of converting all dry forest land into areas growing field crops for purpose of reboisement, it may be said that much may be done in this way to keep up the reproductive power of the soil when other means are not likely to succeed. It is rather the result of bad management than the fault of the cultivator if he is able to go off with an ample yield of grain for himself without benefiting the forest in the way which it was intended that he should.

55. Other special works of improvement undertaken include the opening of flood-ways in the Sukkur, Kashmor and Jhāli bands, and the cutting and clearing of karias or irrigating channels in several forests. Two small bands have been erected on the southern boundaries of Kadrapur and Moro-Mari forests to check the out-flow and to raise the irrigating level of water coming into those forests. Without going expensively into works of this sort, it would be advisable to continue them, especially with a view to improving the irrigation of a forest. Of course the needs of any particular forest must be carefully observed during the season of inundation of the river and advantage ought to be taken of any exceptional overflow to irrigate those areas which are normally dry.

3.—*Past revenue and expenditure.*

56. Appendix H gives the revenue and expenditure of the past 10 years. The average annual gross receipts were Rs. 1,50,147 and the average annual expenditure was Rs. 69,715 giving a net annual income of Rs. 80,432. The change under budget head I of both revenue and expenditure from the year 1895-96 is due to the exploitation of timber and firewood having been done by contract in place of departmental agency from that year.

CHAPTER IV.

Utilisation of the produce.

1.—*Marketable products: requirements to be met.*

57. The marketable products are firewood, timber and minor produce, including grazing. Appendix I exhibits the actual quantities of produce removed annually during the past 10 years. The most important product is firewood and upon the out-turn of it the revenue of the division depends. Both babul and *bahan* yield timber, and *lai* rafters are in use, but, on the